1	COMBINED STABILIZATION BRACKET AND MINE SYSTEM
2	FOR GATHERING UNDERSEA DATA
3	Cross Reference to Related Application
4	This application is a continuation of U.S. Patent
5	Application Serial Number 10/042,842, filed January 11, 2002,
6	entitled "Attachable stabilization Bracket for Versatile Mine
7	System" and assigned to the Government of the United States of
8	America.
9	Statement of Government Interest
10	The invention described herein may be manufactured and used
11	by or for the Government of the United States of America for
12	governmental purposes without the payment of any royalties
13	thereon or therefor.
14	Background of the Invention
15	This invention relates to a stabilizer for a mine emulation
16	system deployed underwater. More particularly, the stabilizer
17	bracket of this invention can be quickly mounted on a
18	cylindrically-shaped underwater mine emulation system to
19	stabilize and orient it in a predetermined fixed attitude to
20	improve the quality of gathered data.
21	Acoustic/seismic, magnetic, and pressure data is collected
22	underwater by numbers of different sensors that usually are
23	contained in one or more housings. The housings are commonly made
24	in cylindrical shapes to protect the sensors and interconnected
25	processing modules from the effects of the ambient water during
26	the long periods of time that sometimes must be spent to collect
27	meaningful amounts of data. The housings additionally must be

- stable and not move since random or uncompensated motion can
- 2 compromise the quality, or even the validity of the gathered
- 3 data.
- 4 One technique currently used to stabilize the cylindrical-
- 5 shaped housings is to put a dense, heavy weight on one side of
- 6 the housing. This side that is weighted would nominally be
- 7 considered the underside since the force of gravity would bring
- 8 it to rest on the ocean bottom. However, because the cylindrical
- 9 shape defines a curved outer surface, the housing is still prone
- 10 to move, or rock due to wave action and/or sea currents. It has
- 11 been noted that noise was present in the magnetic data, and this
- 12 noise was created by sea currents/wave action rocking the housing
- about its cylindrical, or longitudinal axis.
- 14 Thus, in accordance with this inventive concept, a need has
- 15 been recognized in the state of the art for an effective means
- that can be easily connected to a cylindrical-shaped housing to
- 17 stabilize and orient it on the ocean floor.
- 18 Objects and Summary of the Invention
- 19 An object of the invention is to stabilize and orient a
- 20 cylindrical-shaped housing for sensors on the ocean floor.
- 21 Another object is to provide a stabilization structure for
- 22 the cylindrical-shaped mine emulation system to eliminate
- 23 movement caused by wave action and/or sea currents.
- 24 Another object is to provide stabilization structure that is
- easily attached and removed by simple tools.
- Another object is to provide a stabilization structure
- 27 having an outrigger design to create a flat bottom for a

- cylindrical instrumentation housing to enhance its ability to remain stable in high sea states and in strong currents.
- Another object is to provide a cost-effective stabilizing
 structure for a cylindrical housing made from materials resistant
 to the harsh marine environment.

These and other objects of the invention will become more readily apparent from the ensuing specification when taken in conjunction with the appended claims.

Accordingly, the invention stabilizes a cylindrical-shaped undersea package on the sea floor. An outrigger base assembly has a flat base surface to rest on the sea floor and an upper surface having a semi-circular cross-sectional configuration to contiguously fit adjacent to round outer contours of the undersea package. The outrigger base assembly has outrigger portions to laterally extend the flat base surface. First and second case clamps have curved surfaces with semi-circular cross-sectional configurations to extend above the outrigger base assembly. The first and second clamps clamp the curved surfaces onto the round contours of the undersea package and the upper surface of the outrigger base assembly onto the round contours of the undersea package. The first and second case clamps secure the undersea package in an upright orientation and resist tendencies for motion by waves and/or currents.

Brief Description of the Drawings

FIG. 1 is a schematic representation of the stabilizer assembly of the invention installed on an undersea

- 1 instrumentation package, for example a versatile exercise mine
- 2 system (VEMS) on the sea floor.
- FIG. 2 is an isometric, schematic representation of the
- 4 stabilizer assembly removed from the VEMS.
- 5 FIG. 3 is a partially exploded view taken along line 3-3 in
- 6 FIG. 1 showing details of the stabilizer assembly.

7 Description of the Preferred Embodiment

- 8 Referring to FIG. 1, stabilizer system 10 of the invention
- 9 is installed on an undersea instrumentation package, for example
- a versatile exercise mine system (VEMS) 30. VEMS 30 is shown on
- 11 the bottom, or sea floor 40 of a body of water 50 after it has
- 12 been dropped or otherwise deployed such as by cable (not shown)
- from a surface vessel or aircraft. On sea floor 40 VEMS 30 will
- 14 power-up and collect acoustic/seismic, magnetic, and pressure
- data and emulate various real mines.
- VEMS 30 can be an exercise mine, for example the elongate,
- 17 cylindrical-shaped MARK 74 VEMS of the U.S. Navy, that is
- designed to be placed into the ocean and rest on the floor, where
- 19 it will power up and collect acoustic/seismic, magnetic, and
- 20 pressure data and emulate various real mines. By emulating the
- 21 mines, VEMS 30 will retrieve data from its sensors and, via
- 22 software, analyze the data to determine if the mine VEMS 30 is
- emulating would have actuated from the signals received.
- Heretofore, VEMS 30 has been internally weighted so that the
- 25 force of gravity would cause one rounded contour 31 of its
- 26 rounded, cylindrically-shaped housing 32 to come to rest on
- 27 bottom 40 and tend to stay in this orientation. However,

1 practical experience indicates that VEMS 30 is sensitive to wave 2 action and/or sea currents that push against its sides and cause 3 it to rock back and forth on rounded contour 31. This rocking motion affects triaxial magnetic sensors in VEMS 30, since they 4 5 then move relative to the earth's background magnetic field. 6 these sensors, the rocking motion can appear as fluctuating 7 background noise levels (fluctuations occur at frequencies 8 associated with the frequencies of the back and forth motions of 9 VEMS 30). This background noise level can be mistaken as 10 emulations of a mine run by the VEMS 30 as a potential target, or 11 the background noise level could mask a low level target so that 12 VEMS 30 does not recognize it as a target. By stabilizing VEMS 13 30 with stabilization system 10, the magnetic sensors will not move, and consequently the earth's background magnetic field 14 15 should appear to the sensors to be stable. 16 Referring also to FIGS. 2 and 3, in accordance with this 17 invention stabilization system 10 secures an outrigger base assembly 15 to VEMS 30 by a pair of stabilizing case clamps 20 18 and 25 wrapped around and engaging VEMS 30. Stabilizing case 19 clamps 20 and 25 extend parallel with respect to one another and 20 21 are longitudinally separated from each other along VEMS 30. 22 Typically, stabilization system 10 is mounted on VEMS 30 in an 23 assembly area prior to deployment by placing a flat base surface 24 15a of outrigger base assembly 15 on a flat surface 41 beneath 25 VEMS 30 that has been raised by an overhead crane (not shown). The overhead crane lowers VEMS 30 onto outrigger base assembly 26 27 15, and after proper orientation of VEMS 30 has been verified,

1 the two stabilizing case clamps 20 and 25 are placed across the top of VEMS 30. Case clamps 20 and 25 are secured to outrigger 2 base assembly 15 by bolts 22 and 27, respectively. FIG. 3 shows 3 bolts 27 extending through holes 28 in case clamp 25, to engage 4 5 mating threaded bores 29 in assembly 15. Although not shown, it 6 is understood that like bolts 27, bolts 22 also extend through similar holes in clamp 20 to engage similar threaded bores in 7 assembly 15. Tightening bolts 22 and 27 in their respective 8 9 bores causes case clamps 20 and 25 and outrigger base assembly 15 to securely grip, or clamp onto and engage VEMS 30. Installation 10 of stabilizer system 10 on VEMS 30 is now complete. Disassembly 11 is the reverse procedure of this process of assembly. 12 Outrigger base assembly 15 has upper surfaces 16 being 13 essentially semi-circular cross-sectional shaped to fit 14 contiquously adjacent to the essentially circular cross-sectional 15 16 shape of the outer contours 32a of VEMS 30 and has laterally extending outrigger portions 17 that extend flat base surface 17 Stabilizing case clamps 20 and 25 extend above outrigger 18 base assembly 15 between outrigger portions 17 to clamp VEMS 30 19 20 to outrigger base assembly 15 and securely orient VEMS 30 in an upright, or other fixed orientation with respect to sea floor 40. 21 Stabilizing case clamps 20 and 25 do this when bolts 22 and 27 22 are tightened to cause a firm gripping engagement on outer 23 24 contours 32a of VEMS 30 along curved surfaces 21 and 26 that each 25 has an essentially semi-circular cross-sectional shape. Thus, the orientation of VEMS 30 with respect to sea floor 40 (or the 26 relative angle between outrigger base assembly 15 and VEMS 30 or 27

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another external reference) is fixed and does not change throughout the period of an operational deployment while data is 2 3 being gathered. The design and construction of the stabilizer system 10 are 4 5 uncomplicated to lower construction costs. Outrigger base 6 assembly 15 and stabilizer base clamps 20 and 25 can be suitably 7 constructed of strong aluminum, stainless steel, or other materials that can handle the expected loads induced by water 8 9 entry and coming to rest against bottom 40, and bear the weight 10 of VEMS 30. The materials are chosen to be non-corrosive, or 11 corrosion resistant so as not to be affected by salt water. 12 Stabilizer system 10 is not intended to be a lifting mechanism or 13 hard point for deployment of VEMS 30. Other hard points and/or 14 connecting structure (not shown) associated with VEMS 30 are used for deployment to sea floor 40. Outrigger base assembly 15 is 15 16 built to be sufficiently strong to support the weight of VEMS 3017 on sea floor 40 with the attached stabilizer system 10. FIG. 3 shows threaded bolts 27, flat washers 27a, and lock 18 19 washers 27b as attachment hardware for stabilizing case clamp 25. Although flat washers, lock washers, holes, and threaded bores 20 associated with bolts 22 are not shown it is understood that 21 22 stabilizing case clamp 20 also can be connected to outrigger base 23 assembly 15 in this manner. Other mechanisms to connect stabilizing case clamps 20 and 25 to the outrigger base assembly 24 15 might be chosen, such as hinges, over-center latches, captive 25 pins, etc. Stabilizing case clamps 20 and 25 and/or outrigger 26 27 base assembly 15 could also utilize rubber pads, or other

1 resiliently engaging means 21a, 26a, and 16a to prevent damage to 2 VEMS 30 and its protective coating, and to provide additional 3 gripping frictional force. Stabilizing case clamps 20 and 25 can have a variety of cross-sectional shapes, such as square, 4 triangular, circular, elliptical, for examples. Outrigger base 5 6 assembly 15 can be made from different stock including square 7 tube, round tube, I-beams, C-beams, or other cross-sectional 8 shapes. An exemplary VEMS 30 having a diameter of 21.0 inches 9 can have outrigger base assembly 15 and stabilizing case clamps 10 20 and 25 shaped to have an inner radius of 10.5 inches to 11 accommodate the exemplary VEMS 30. The length and width of 12 outrigger base assembly 15 should be the maximum practical length 13 so as not to interfere with detachable hardware or sensors or access ports on the exemplary VEMS 30. Therefore, outrigger base 14 15 assembly 15 of stabilizer system 10 provides a flat bottom for 16 VEMS 30 and greatly enhances the ability of VEMS 30 to remain 17 stable even in high sea states or locations where strong sea 18 currents are prevalent. 19 Having the teachings of this invention in mind, different 20 applications, modifications and alternate embodiments of this invention may be adapted. Stabilizer system 10 can be made in 21 larger or smaller sizes and in a multitude of different shapes, 22 23 and could be made from a wide variety of materials. words, the design and construction of stabilizer system 10 allows 24 for accommodation of different underwater systems other than the 25 cylindrical shape of VEMS 30 by substituting differently 26 dimensioned and shaped components. Stabilizer system 10 of the 27

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invention can easily be removed and reinstalled if necessary, and 1 simple tools are all that are required to perform this operation. 2 Optionally, the reliable, uncomplicated and cost effective design 3 of stabilizer system 10 can permit its non-recyclable use to 4 stabilize undersea packages. Other modifications could be made 5 as will be apparent to one skilled in the art to which this 6 7 invention pertains. The disclosed components and their arrangements as disclosed 8 herein all contribute to the novel features of this invention. 9 Stabilizer system 10 of this invention is an effective 10 improvement that can be readily connected or disconnected to 11 enable its addition or removal from VEMS 30 without undue effort. 12 Therefore, stabilizer system 10, as disclosed herein is not to be · 13 construed as limiting, but rather, is intended to be 14 demonstrative of this inventive concept. 15 It should be readily understood that many modifications and 16 variations of the present invention are possible within the 17 purview of the claimed invention. It is to be understood that 18 within the scope of the appended claims the invention may be 19 practiced otherwise than as specifically described. 20 21